

What is claimed is:

1. A method for scheduling downstream transmissions in a cable modem termination system, the method comprising:
  - selecting a queue based on its priority level and a state of the queue;
  - when the selected queue has data, scheduling transmission of a packet of data for the selected queue; and
  - when a packet is scheduled for the selected queue, determining whether higher priority queues have data before scheduling additional transmissions.
2. The method of claim 1, wherein selecting a queue comprises:
  - selecting a queue with the highest priority level;
  - determining whether there is data in the selected queue;
  - when there is no data in the selected queue, moving to another queue; and
  - when there are no additional queues at the priority level, moving to the next priority level.
3. The method of claim 1, and further comprising:
  - when a packet of data is scheduled for the selected queue, determining whether a usage limit has been exceeded for the selected queue;
  - when the usage limit is exceeded, removing the selected queue from further consideration for scheduling transmissions.
4. The method of claim 1, wherein determining whether higher priority queues have data comprises:
  - returning to the highest priority level; and
  - checking active queues at each priority level until reaching a queue with data.
5. A method for scheduling transmission of downstream data in a cable modem termination system, the method comprising:

allocating a selected percentage of bandwidth for use by each of a plurality of queues;

when a queue is idle, sharing the bandwidth among active queues in a ratio proportionate with the percentage of bandwidth assigned to each of the plurality of queues.

6. The method of claim 5, wherein allocating a selected percentage of bandwidth comprises allocating a minimum percentage of the bandwidth for each queue.

7. The method of claim 5, wherein sharing the bandwidth among active queues comprises shortening a time interval for transmission when active queues have met their respective bandwidth limit and at least one queue is idle.

8. A method for scheduling transmission of downstream data in a cable modem termination system, the method comprising:

    scheduling transmission of packets of data in a plurality of prioritized queues in order of priority; and

    limiting each queue to a maximum amount of data in a time interval to allow low priority queues to transmit data.

9. The method of claim 8, and further comprising checking for data in higher priority queues upon scheduling transmission of a packet.

10. The method of claim 8, wherein limiting each queue comprises removing the queue from consideration for scheduling transmissions when a threshold is exceeded.

11. A method for controlling access to a shared medium, the method comprising:

- classifying packets received into a plurality of flows;
- policing each flow for compliance with selected data rates;
- storing data for each flow in one of a plurality of queues at a selected priority level; and

scheduling transmissions from the plurality of queues, including:

selecting a queue based on its priority level and a state of the queue,  
when the selected queue has data, scheduling transmission of a packet of  
data for the selected queue, and  
when a packet is scheduled for the selected queue, determining whether  
higher priority queues have data before scheduling additional  
transmissions.

12. The method of claim 11, wherein selecting a queue comprises:

selecting a queue with the highest priority level;  
determining whether there is data in the selected queue;  
when there is no data in the selected queue, moving to another queue; and  
when there are no additional queues at the priority level, moving to the next  
priority level.

13. The method of claim 11, and further comprising:

when a packet of data is scheduled for the selected queue, determining whether a  
usage limit has been exceeded for the selected queue;  
when the usage limit is exceeded, removing the selected queue from further  
consideration for scheduling transmissions.

14. The method of claim 11, wherein determining whether higher priority queues  
have data comprises:

returning to the highest priority level; and  
checking active queues at each priority level until reaching a queue with data.

15. A method for scheduling transmission of downstream data in a cable modem  
termination system, the method comprising:

scheduling transmission of packets of data in a plurality of prioritized queues in  
order of priority; and

checking for data in high priority queues each time a packet of data is scheduled for transmission.

16. A method for scheduling downstream transmissions in a cable modem termination system, the method comprising:

- selecting a highest priority level;
- selecting a queue in the highest priority level;
- determining whether there is data in the selected queue;
- when there is no data in the selected queue, moving to the next queue;
- when there are no additional queues at the priority level, moving to the next priority level;
- when there is data in a selected queue, scheduling transmission of a packet of data;
- when a packet is scheduled, determining whether a usage limit has been exceeded;
- when the usage limit is exceeded, removing the queue from further consideration for scheduling transmissions; and
- when a packet is scheduled, returning to the highest priority level to allow priority handling of late arriving priority data.

17. A computer readable medium for causing a computer to execute a method, the method comprising:

- selecting a queue based on its priority level and a state of the queue;
- when the selected queue has data, scheduling transmission of a packet of data for the selected queue; and
- when a packet is scheduled for the selected queue, determining whether higher priority queues have data before scheduling additional transmissions.

18. The computer readable medium of claim 17, wherein selecting a queue comprises:

- selecting a queue with the highest priority level;
- determining whether there is data in the selected queue;

when there is no data in the selected queue, moving to another queue; and  
when there are no additional queues at the priority level, moving to the next  
priority level.

19. The computer readable medium of claim 17, and further comprising:
  - when a packet of data is scheduled for the selected queue, determining whether a usage limit has been exceeded for the selected queue;
  - when the usage limit is exceeded, removing the selected queue from further consideration for scheduling transmissions.

20. The computer readable medium of claim 17, wherein determining whether higher priority queues have data comprises:

returning to the highest priority level; and  
checking active queues at each priority level until reaching a queue with data.

21. A downstream scheduler for a cable modem termination system, the downstream scheduler including:

a classifier, adapted to receive incoming packets, and adapted to determine a traffic flow associated with the received packets;  
a traffic policer, responsive to the classifier, the traffic policer adapted to monitor each flow for compliance with selected data rates and adapted to store the data packets in associated queues; and  
a transmission scheduler, the transmission scheduler including a computer

readable medium for performing a method comprising:

- selecting a queue based on its priority level and a state of the queue,
  - when the selected queue has data, scheduling transmission of a packet of data for the selected queue, and
  - when a packet is scheduled for the selected queue, determining whether higher priority queues have data before scheduling additional transmissions.

22. The downstream scheduler of claim 21, wherein selecting a queue comprises: selecting a queue with the highest priority level; determining whether there is data in the selected queue; when there is no data in the selected queue, moving to another queue; and when there are no additional queues at the priority level, moving to the next priority level.
23. The downstream scheduler of claim 21, and further comprising: when a packet of data is scheduled for the selected queue, determining whether a usage limit has been exceeded for the selected queue; when the usage limit is exceeded, removing the selected queue from further consideration for scheduling transmissions.
24. The downstream scheduler of claim 21, wherein determining whether higher priority queues have data comprises: returning to the highest priority level; and checking active queues at each priority level until reaching a queue with data.
25. A computer readable medium for causing a computer to execute a method, the method comprising:
- selecting a highest priority level;
  - selecting a queue in the highest priority level;
  - determining whether there is data in the selected queue;
  - when there is no data in the selected queue, moving to the next queue;
  - when there are no additional queues at the priority level, moving to the next priority level;
  - when there is data in a selected queue, scheduling transmission of a packet of data;
  - when a packet is scheduled, determining whether a usage limit has been exceeded;

when the usage limit is exceeded, removing the queue from further consideration for scheduling transmissions; and

when a packet is scheduled, returning to the highest priority level to allow priority handling of late arriving priority data.